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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/992,387	11/16/2001	Anthony L. Coyle	50000.2162	7595

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EXAMINER
LEWIS, MONICA

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 06/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/992,387	COYLE ET AL.	
	Examiner	Art Unit	
	Monica Lewis	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 November 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 November 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. This action is in response to the application filed November 16, 2001.

Election/Restrictions

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-10, drawn to a semiconductor structure for a Ball Grid Array package, classified in class 257, subclass 690.

II. Claims 11-16, drawn to the method for manufacturing a semiconductor structure for a Ball Grid Array package, classified in class 438, subclass 108.

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

A telephone conversation took place with Gary Honeycutt on June 6, 2002 which resulted in a provisional election being made without traverse to prosecute a semiconductor structure for a Ball Grid Array package, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-16 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Information Disclosure Statement

3. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "101"has been used to designate both thin-film interposer and polymer film (See Page 9 Line 32); and b) "103 has been used to designate metal foil, conductive lines and adjacent interposer (See Page 10 Line 31, Page 12 Line 31 and Page 14 Line 9). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: a) 102 (See Figure 1); and b) 106a (See Figure 1). A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

6. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 9 depends from itself.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 2, 4, 5 and 7-10 are rejected under 35 U.S.C. 103(a) as obvious over Elder et al. (U.S. Patent No. 5,123,850) in view of Gillette et al. (U.S. Patent No. 5,831,832).

In regards to claim 1, Elder et al. ("Elder") discloses the following:

a) an integrated circuit chip (21) having an outline (See Figure 1);

b) active and passive surfaces (See Column 1 Lines 20-24);

c) active components including a plurality of contact pads on said active surface (See Column 3 Lines 36-37);

d) a plurality of electrical coupling members attached to said contact pads, said coupling members selected from a group consisting of gold bumps, copper bumps, copper/nickel/palladium bumps, and z-axis conductive epoxy (24) (See Column 3 Lines 36-37, 50 and 51);

e) an electrically insulating thin-film interposer having first and second surfaces (17 and 20), a plurality of electrically conductive lines (19) integral with said first surface, a plurality of electrically conductive paths extending through said interposer, contacting said conductive lines and forming exit ports on said second surface (See Figure 1); and

f) chip coupling members attached to said conductive lines, covering an area portion of said first interposer surface (See Figure 1).

In regards to claim 1, Elder fails to disclose the following:

a) contact pads spaced apart by less then 100 um.

However, the applicant has not established the critical nature of the dimension of "contact pads spaced apart by less then 100 um." "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

b) encapsulation material protecting said passive chip surface and at least a portion of said first interposer surface not covered by said attached chip.

However, Gillette et al. ("Gillette") discloses an encapsulant (42) for a ball grid array package (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Elder to include an encapsulant as disclosed in Gillette because it aids in providing environmental protection for the chip.

In regards to claim 2, Elder fails to disclose the following:

a) solder balls attached to said exit ports on said second interposer surface.

However, Gillette discloses solder balls for a ball grid array package (See Column 1 Lines 24-26). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Elder to include solder balls as disclosed in Gillette because it aids in providing a connection among the components.

In regards to claim 4, Elder discloses the following:

a) interposer is a polyimide film (See Figure 1).

In regards to claim 5, Elder discloses the following:

a) interposer has an outline larger than said outline of said chip (See Figure 1).

In regards to claim 7, Elder fails to disclose the following:

a) coupling member attachment is provided by metal interdiffusion of thermo-compression bonding.

However, the limitation of "provided by metal interdiffusion of thermo-compression bonding" makes it a product by process claim. The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A *"product by process"* claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972): *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); In re Fessmann, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a *"product by, all of"* claim, and not the patentability of the process, and that an old or obvious product, whether claimed in *"product by process"* claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 8, Elder fails to disclose the following:

a) encapsulation material is a molding compound.

However, Gillette discloses an encapsulant for a ball grid array package (See Figure 2 and Column 3 Lines 62-63). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Elder to include an encapsulant as disclosed in Gillette because it aids in providing environmental protection for the chip.

In regards to claim 9, Elder discloses the following:

a) molding compound has the same outline as said interposer (See Figure 1).

In regards to claim 10, Elder discloses the following:

a) an integrated circuit chip (21) having an outline (See Figure 1);

b) active and passive surfaces (See Column 1 Lines 20-24);

c) active components including a plurality of contact pads on said active surface (See Column 3 Lines 36-37);

d) a plurality of electrical coupling members attached to said contact pads, said coupling members selected from a group consisting of gold bumps, copper bumps, copper/nickel/palladium bumps, and z-axis conductive epoxy (24) (See Column 3 Lines 36-37, 50 and 51);

e) an electrically insulating thin-film interposer having first and second surfaces (17 and 20), a plurality of electrically conductive lines (19) integral with said first surface, a plurality of electrically conductive paths extending through said interposer, contacting said conductive lines and forming exit ports on said second surface (See Figure 1); and

f) chip coupling members attached to said conductive lines, covering an area portion of said first interposer surface (See Figure 1).

In regards to claim 10, Elder fails to disclose the following:

a) encapsulation material protecting said passive chip surface and at least a portion of said first interposer surface not covered by said attached chip.

However, Gillette discloses an encapsulant for a ball grid array package (See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Elder to include an encapsulant as disclosed in Gillette because it aids in providing environmental protection for the chip.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as obvious over Elder et al. (U.S. Patent No. 5,123,850) in view of Gillette et al. (U.S. Patent No. 5,831,832) and Akram (U.S. Patent No. 5,898,224).

In regards to claim 3, Elder fails to disclose the following:

a) non-conductive polymer underfilling any spaces between said chip coupling members attached to said conductive lines under said chip.

However, Akram discloses non-conductive polymer underfilling (See Column 2 Lines 12-18). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Elder to include non-conductive polymer underfilling as disclosed in Akram because it aids in reinforcing electrical connections.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as obvious over Elder et al. (U.S. Patent No. 5,123,850) in view of Gillette et al. (U.S. Patent No. 5,831,832) and Kelly et al. (U.S. Patent No. 5,798,567).

In regards to claim 6, Elder fails to disclose the following:

a) electrically conductive lines are made of a material selected from a group consisting of copper, copper alloy, or copper plated with tin, tin alloy, silver, or gold.

However, Kelly et al. ("Kelly") discloses gold wires (See Column 4 Lines 53-57). It would have been obvious to one having ordinary skill in the art at the time the invention was

made to modify the semiconductor of Elder to include gold wires as disclosed in Kelly because it is a good heat conductor.

Conclusion

11. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: a) Loo (U.S. Patent No. 5,637,920) discloses a high contact density ball grid array package; b) Degani et al. (U.S. Patent No. 5,646,828) discloses thin packaging of multi chip modules; c) Love et al. (U.S. Patent No. 5,773,889) discloses wire interconnect structures; d) Rostoker et al. (U.S. Patent No. 5,801,432) discloses an electronic system using multiplayer tab tape; e) Fallon et al. (U.S. Patent No. 5,872,051) discloses a process for transferring material to semiconductor chip pads; f) Pace (U.S. Patent No. 5,904,499) discloses a package for power semiconductor chips; and g) Johnson (U.S. Patent No. 5,937,515).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML
June 12, 2002

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